

REMARKS

The Official Action of September 13, 2004 has been carefully considered and reconsideration of the application as amended is respectfully requested.

The indication that claims 7, 14-17 and 19-22 are allowed, and that claims 3 and 9-13 would be allowable if rewritten in independent form, including all of the limitations of the base claim and any intervening claim, has been noted with appreciation.

Claim 5 has now been amended by the incorporation of the recitations formerly in claim 9 in accordance with the support provided in the specification at, for example, page 14, lines 7-16 read in conjunction with page 32, lines 13-16. The claim as amended is believed to be free of the art cited in paragraph 3 of the Official Action in view of the comments of the Examiner at paragraph 4 of the Official Action, wherein she acknowledges that the cited art does not show or suggest an ink set as claimed wherein the dark ink is cyan and/or magenta and the light ink is light cyan and/or light magenta.

Claim 1 has now been amended by the incorporation of the recitations formerly in claim 4, and claim 4 has been canceled. The subject matter of claims 1, 2, 4-5 and 23-25 stands rejected under 35 USC 102(b) as allegedly being anticipated by JP 10-315445. Applicants respectfully traverse this rejection.

The invention as claimed in claim 1 as amended is based in part on Applicants' discovery that, in the claimed ink set, the difference between the ratio of resin (dispersant) to pigment (B/P) between the light ink and the dark ink is a result-effective variable. This discovery is discussed next.

In general, the amount of resin is the amount of dispersant sufficient for a pigment to be dispersed.

The claimed invention defines the difference between a ratio between resin weight proportion B_1 and pigment weight proportion P_1 (B_1/P_1) in a light ink and a ratio between resin weight proportion B_2 and pigment weight proportion P_2 (B_2/P_2) in a dark ink as being between 0.01 to 0.5. This requires that the B_1/P_1 in the light ink should be higher than the B_2/P_2 in the dark ink. However, it also requires that the difference in the ratios between both inks should not be too large.

An effect of the claimed invention is to provide high quality ink images substantially "with no roughness" (see specification at page 3, penultimate paragraph). The inventors have previously confirmed that a light ink exhibits relatively-strong glossiness and a dark ink exhibits relatively-weak glossiness.

The inventors' considerations were as follows: since a light ink has a low pigment concentration, its pigment spreads flatly and thinly on a recording medium. As a result, when the medium is exposed to light, intense reflected light is observed.

Meanwhile, since a dark ink has a high pigment concentration, the particles of the pigment are piled unevenly on a recording medium and thus the glossiness is relatively less.

On this basis, the inventors considered that "roughness" occurs due to the large difference in glossiness between the light ink and the dark ink. They have discovered that the "roughness" of an entire image can be eliminated by increasing the ratio of resin to pigment in the light ink to higher than that of the dark ink.

The inventors have also discovered that, if the ratio of resin to pigment in the light ink relative to that of the dark ink is increased too much (a difference of 0.5 or more), a rough image is exhibited. They believe that this phenomenon may be due to the balance between the permeability of the light ink and that of the dark ink breaking down.

To show the result-effective nature of the recited difference in the aforementioned ratios, the inventors conducted an evaluation using ink set A described on pages 50-53 of the specification as "Embodiment 1" and the following comparative set:

In the comparative ink set, the amount of resin (styrene-acrylic acid copolymer) in a light magenta ink was made 0.88% and the amounts of the other components were kept the same as in the ink set A described in Embodiment 1.

Furthermore, the amount of resin in a light cyan ink was made 0.75%, and the other components were kept the same as in the ink set A described in Embodiment 1. For the other inks, those having the same components as used in ink set A were used.

The ink set obtained above is referred to as ink set K.

Light magenta ink composition in ink set K:

Pigment red 122	0.7%
Styrene-acrylic acid copolymer	0.88%
[B/P= 1.25]	
Glycerin	18%
Ethylene glycol	5%
Diethylene glycol	5%
Surfynol 465	0.8%
Triethylene glycol monobutyl ether	5%
2-pyrrolidone	4%
Water	balance

Light cyan ink composition in ink set K:

Pigment blue 15:3	0.6%
Styrene-acrylic acid copolymer	0.75%
[B/P=1.25]	
Glycerin	20%

Triethanolamine	0.7%
Surfynol 465	1.2%
Triethylene glycol monobutyl ether	6%
2-pyrrolidone	6%
Water	balance

When they conducted a print evaluation using ink set K, the inventors observed a roughness in images involving human body curves. The inventors concluded that ink set A has an advantage over ink set K.

The Examiner considers that, in the cited reference JP10-315445, the difference between the ratio between the resin weight proportion and pigment weight proportion in the light ink composition and the ratio between the resin weight proportion and pigment weight proportion in the dark ink composition is within the claimed range. Applicants respectfully disagree. The Examiner has calculated the difference between B1/P1 and B2/P2 with reference to paragraphs [0055] and [0056] of the English translation of the reference on the assumption that (a) the dark ink composition comprises 20% pigment and 5.33% resin; and (b) the light ink composition comprises 10% pigment and 3.78% resin. However, Applicants respectfully submit that this is an **incorrect** assumption, as next discussed.

The components referred to in the subject paragraphs of the reference are pigment dispersant liquids, not ink compositions that are used for image formation. In

particular, as can be gleaned from the first sentence of paragraph [0056], the dark ink composition and the light ink composition are obtained by adding the prescribed amount of the solutions comprising the resin to the above pigment dispersant liquids to achieve 10wt% and 2wt% pigment amounts respectively [0056]. (This is the meaning of the sentence which reads, in imprecise translation: "Way this dispersion it becomes pigment concentration 10wt% and 2wt%.") In the cited example of the reference, 100 parts and 900 parts of the solutions are added to the pigment dispersant liquid.

The obtained dark and light ink compositions are as follows:

Dark ink composition (10wt% pigment):

$$\begin{aligned} B1:P1 &= 0.31 \times (17.2 + 7.2) / 200 : 20 / 200 \\ &= 7.5 / 200 : 20 / 200 \\ &= 7.5 : 20 \end{aligned}$$

Light ink composition (2wt% pigment):

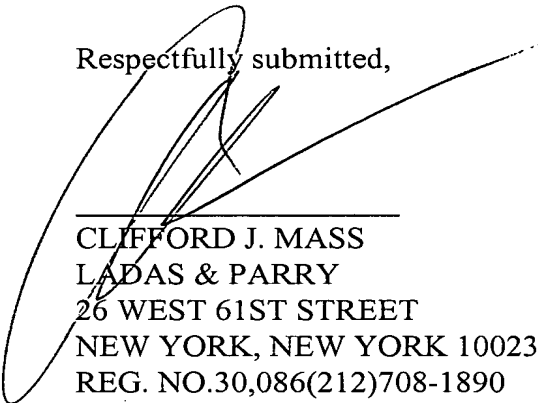
$$\begin{aligned} B2:P2 &= 0.31 \times (17.2 + 7.2 \times (1000 - 100) / 100) / 1000 : 20 / 1000 \\ &= 25.4 / 1000 : 20 / 1000 \\ &= 25.4 : 20 \end{aligned}$$

In view of the above, it is respectfully submitted that a correct calculation of the difference between B1/P1 and B2/P2 for the reference example is: B1/P1=0.375 (7.5/20), B2/P2=1.27 (25.4/20) and the difference is 0.89. This difference is outside

of the claimed range of 0.01 to 0.5 and the reference thus does not anticipate claim 1 as amended. Moreover, since the reference does not teach (and in fact teaches away from) the claimed range and does not recognize the result-effective nature of the claimed parameter, the reference also does not set forth even a *prima facie* case of obviousness for the invention as claimed.

In view of the above, it is respectfully submitted that all rejections and objections of record have been overcome and that the application is now in allowable form. An early notice of allowance is earnestly solicited and is believed to be fully warranted.

Respectfully submitted,



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